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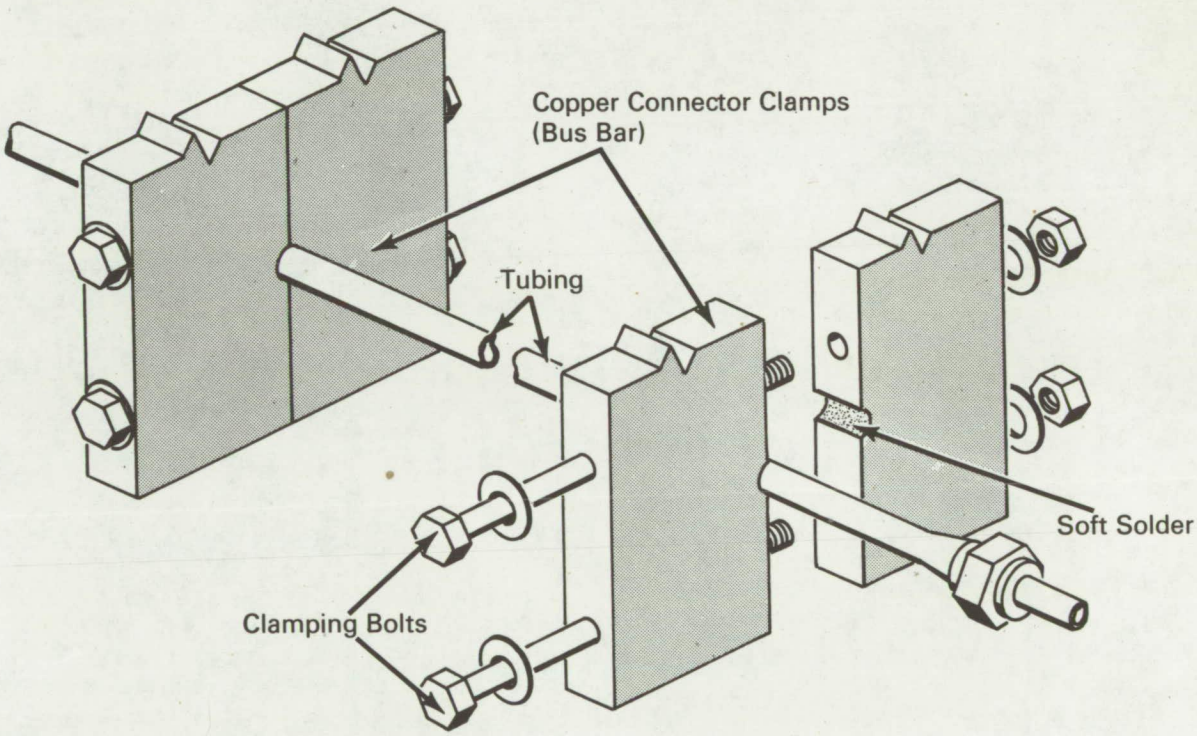
Brief 67-10140

NASA TECH BRIEF

Clamp Provides Efficient Connection for High-Density Currents



The problem:

To investigate very high heat transfer rates, it was necessary to provide 7000 amperes of current to a section of 0.250-inch o.d. × 0.020-inch wall, type 347 stainless steel tubing, containing hydrogen gas at 1500 psi pressure. Fusion-bonded (welded or brazed) electrical connections could not be used because of the degradation of the physical properties of the stainless steel specimen. Ordinary clamped connections were subject to high resistance problems and capacitative arcing across minor surface imperfections.

The solution:

An electrical connector clamp (bus bar) that provides essentially 100 percent contact-surface efficiency through the use of a cold-flowed lead solder film between the faying surfaces of the clamp and tubing. The film provides the electrical equivalent of a fusion bond without significantly degrading the grain structure of the materials, and permits disassembly and reuse of the components.

How it's done:

The clamps are fabricated from 0.5-inch copper plate to fit the tubing, with 0.002-inch diametral inter-

(continued overleaf)

ference. The faying surfaces in the clamp bore are flash tinned with soft solder, resulting in a coating of approximately 0.001-inch thickness. After the tubing is inserted, tightening of the clamping bolts against this total of 0.004-inch diametral interference forces cold flow of the soft solder, which completely fills all interfacial voids at the faying surfaces.

Notes:

1. Although there is limited industrial requirement for current densities of this magnitude (17,500 amperes per square inch), significant benefits in reduced power losses and contact surface protection can be realized at the lower current densities used in such processes as electroplating, electric resistance welding, and electrochemical machining.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B67-10140

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: D. M. Trebes and J. R. McCarthy
of North American Aviation, Inc.
under contract to
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